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AUTHOR Wilkinson, William K.; Migotsky, Christopher P.
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ABSTRACT

Empirical findings related to the development of a new measure of epistemological style are reported. After a review of available epistemological style inventories and individual item qualities, 93 items reflecting 7 epistemological styles were selected. The scale was administered to 222 college undergraduates and graduate students (102 males and 120 females). The seven scale scores were submitted to Varimax orthogonal rotation to distill common factors empirically. As hypothesized, the following three factors emerged: (1) naive realism, which accounted for the intercorrelation between dualism and logical positivism; (2) logical inquiry, comprising the scales of empiricism, rationalism, and thinking; and (3) skeptical subjectivism, pertaining to the interrelationships between relativism and metaphorism. Findings are discussed in terms of theoretical and practical implications for the classroom and for student development. One figure illustrates the tri-level cognitive period, and two tables display study findings. (SLD)

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# Toward a New Understanding of Epistemologicial Style: A Preliminary Factor Analysis of Epistemological Style Inventories

William K. Wilkinson and Christopher P. Migotsky
New Mexico State University

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## Abstract

We report empirical findings pertaining to the development of a new measure of epistemological style. After reviewing available epistemological style inventories and individual item qualities we selected 93 items comprising seven epistemological styles. The seven scale scores were submitted to Varimax orthogonal rotation in order to empirically distill common factors . As we hypothesized, three factors emerged as follows: (a) naive realism, which accounted for the intercorrelation among the dualism and logical positivism, (b) logical inquiry, comprising the scales of empiricism, rationalism, and thinking, and (c) skeptical subjectivism, pertaining to the interrelationships between relativism and metaphorism. Our findings are discussed in terms of theoretical and practical implications to the classroom and student development.

# Toward a New Understanding of Epistemological Style: A Preliminary Factor Analysis of Epistemological Style Inventories

The most recent AERO newsletter (Levy, 1992) contained an article in which the author proposes to "empirically" study a teachers' "chain of reasoning". Of interest to us, are the epistemological themes alluded to in the paper, like rationalism and empiricism. In this paper, we further discuss (a) the practical applications of epistemological style, and (b) the development of an objective, comprehensive measure of the style.

Epistemological style can be viewed as the highest level of three levels of thought (Kitchener, 1983). The three levels of thought are cognition, metacognition, and epistemic cognition. An illustration of Kitchener's three tiered model can be found in Figure 1.

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Insert Figure 1 about here

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As noted in Figure 1, epistemic thought encompasses our knowledge about knowing; the limits, criteria, and certainty of knowing. Although epistemological thought is placed at the highest point on the pyramid, all levels are required as foundations for the next level and are not subsumed by the higher levels. Epistemological style builds on the previous two levels and provides the individual with a strategy to monitor various solutions to problems.

The educational applications of epistemological style are numerous. As just one example of the relevance to education, Stephenson and Hunt (1977) conducted a study to partially replicate Knefelkamp's (1974) results in determining whether various teaching methods could speed the movement of dualistic students along Perry's (1968) developmental scheme. In Perry's model, students progress through a series of epistemological positions following a set order; dualism, multiplism, relativism, and finally commitment. In their study, Stephenson and Hunt attempted to move dualistic students (individuals viewing the teacher as "expert" and simply wanting the "facts") toward multiplism and relativism in which they tend to view alternate explanations as legitimate and valid solutions depending on the context of the situation. The treatment group in the study received instructional intervention based on a system of both challenges and supports. In this group, students' would be challenged to view alternate solutions to problems and think in increasingly complex ways. In order to aid the students toward a gradual transition, support was given to ease the cognitive dissonance created through the challenging instructional procedure.

In their pretest-posttest design they discovered that their treatment group produced many more multiplists and relativists than the control groups. The results are encouraging, especially assuming the teacher's role is both instructional and developmental in nature. Teachers apparently do have the ability

to help students' progress to more sophisticated epistemological orientations.

Epistemological orientations have been linked to many psychological variables (Wilkinson and Schwartz, 1991) and potential applications to the classroom are abundant. Successful applications are dependent on accurate assessment of epistemological style. Unfortunately, accurate assessment is not an easy achieved task.

The problem plaguing most studies involving epistemological style is an inadequate personal epistemological measuring instrument. Researchers intent on assessing personal epistemologies have not integrated previous findings into their current research, thus producing possibly redundant measurement devices. Currently, a few researchers have developed assessment systems to measure how people think epistemologically, these investigators employing self-report devices such as those found in Table 1.

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Insert Table 1 about here

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A perusal of Table 1 reveals seven different epistemological styles, each style supposedly identifying individual differences in what knowledge is and how it is acquired (Wilkinson, 1989). However, because the meaning of the seven scales appear similar, we were interested in empirically determining the degree to which the above named scales overlap. In addition to the four

instruments listed in Table 1, we included two exploratory measures designed to assess personal epistemologies. Items on the two questionnaires, the Epistemic Differential (Kimble, 1984) and Ideas of Science (Strike and Posner, 1982), were integrated into the seven scales listed in Table 1 based on independent classification by the two authors. Items classified into the same scales by the researchers were included.

In formulating correlational hypotheses, an inspection of Table 1 reveals potential similarities between purported styles. For example, we speculated that one general epistemological style would consist of the dualism and logical positivism scales. We propose that a person with this orientation will focus on products (e.g. facts) rather than how these products are obtained. Further, these accepted "facts" will likely be perceived as absolute and unchanging.

We conjectured that a second epistemological orientation would emerge from the rationalism, thinking, and empiricism scales. For example, a person with this style may emphasize the process by which knowledge is acquired, concentrating on the systematic, logical integration of observations.

Finally, we hypothesized a third style, consisting of the relativism and metaphorism scales. A person with this epistemological orientation may use a subjective, context approach to knowledge (e.g. "it depends on..."). Individuals holding this view would be most accepting of divergent viewpoints, noting that there are equally valid ways of solving a

particular problem. In fact, the validity of knowledge for this individual may be dependent on how an idea "feels" (e.g. intuition) rather than how it logically fits with existing findings.

To test our hypothesis, we developed a questionnaire based on previous instruments purportedly measuring epistemological styles. Based on psychometric data provided in test manuals and a pilot study conducted the summer before the primary fall semester study, the most valid items from the previous instruments were chosen to be on our test inventory.

## Method

### Subjects

Upon completing informed consent, 251 subjects voluntarily agreed to participate in the study. Twenty-nine subjects produced unusable data, resulting in a final sample of 222 subjects. We defined unusable data as (a) three or more missing items, or (b) random response patterns as detected during administration.

In regards to demographic qualities of the sample, there were 120 females and 102 males, whose ages ranged from 17 to 64 years old, with a mean age of 25. The distribution of college rank was (percentages in parentheses): 6 (3%) freshman, 21 (10%) sophomores, 78 (35%) juniors, 85 (38%) seniors, and 32 (14%) graduate students. In terms of college major, the sample contained the following break down of people majoring in the

following colleges within the university: 41 (18%) arts and sciences, 60 (27%) business, 39 (17%) engineering, 21 (10%) agriculture and home economics, 22 (10%) education, 11 (5%) human and community services, and 28 (13%) graduate school. Five ethnic groups were represented in the following numbers: 161 (73%) White, 47 (21%) Hispanic, 6 (3%) Black, 4 (2%) Asian, and 4 (2%) Native American.

The sample was drawn from a target population of college students attending a moderate sized public university, with participants selected from courses offered in the fall semester during which the study was conducted. The final sample included 16 courses from the seven colleges within the university.

Instrumentation

We developed a single inventory from six previous assessment instruments purportedly measuring individual's beliefs about knowledge. The resultant 93 item inventory consisted of two sections; a 75 item five point Likert scale section, and an 18 item semantic differential section. Two versions of the inventory were produced in an attempt to counterbalance item order response bias; one in which the Likert items were responded to first and the other in which the semantic differential items were encountered first.

Procedure

The inventory was administered during a ten week period in the fall semester. All inventories were directly administered to the students by the second author. Appointments were made with professors to administer the inventory during regular class periods. The standardized administration was as follows for all appointments. The administrator would pass out test packets, one per student, that contained within a numbered manilla folder one of each of the following items: informed consent form, computer scorable answer sheet, and the inventory (either version one or version two). The students were informed that the number on their test packet was their subject ID number and thus confidentiality was ensured for the duration of the study. The students were led through the consent form and asked to sign and date it if they wished to participate. All consent forms and test packets of those declining to participate were collected. The administrator then guided the students through the demographic information items on the questionnaire. Once all students had completed these sections, the researcher read the inventory instructions aloud to the students while they silently read the same instructions on their individual questionnaire. Clarifications were made if necessary and the students were then requested to complete the questionnaire at their own pace.

While students were completing the items, the administrator proctored the subjects by walking up and down rows of students. This proctoring was an attempt to limit random responses by students to the items. Through this process, five questionnaires were marked as questionable by the researcher and not submitted to data analysis.

When subjects were finished with their inventory, the researcher collected their questionnaire and answer sheet and delivered a debriefing form to the student. This form explained the research hypothesis we were attempting to answer and contained phone numbers for subjects to obtain feedback about their patterns of responses and/or further information about the study.

## Results and Discussion

Our investigation involved a factor analysis of the seven scales on the questionnaire to determine whether interpretable factors would emerge. An orthogonal factor analysis was conducted using the Statistical Analysis System (SAS). Table 2 depicts the three derived factors and the scale factor loadings.

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Insert Table 2 about here

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The three factors accounted for 64% of the variance. The first factor accounted for 24% of the variance and was composed

of the dualism and logical positivism scales. The second factor accounted for 24% of the variance and was composed of the empirical, rational, and thinking scales. The final factor accounted for 16% of the variance and comprised the metaphorical and relativism scales.

It appears that our research hypothesis was supported by the results of the factor analysis. Three factors emerged consolidating the seven scales into three interpretable components. Our interpretation of the factors follows.

The scales of logical positivism and dualism clustered to create factor 1 which we termed "Naive Realism" due to its basis in observational reality rather than theoretical forethought. A person with this view would tend to believe that facts exist and place their energies into learning those facts. The second factor was formed through the convergence of the scales of empiricism, rationalism, and thinking; we termed this factor "Logical Inquiry" due to its emphasis on systematic methodology. A person with this view is primarily concerned with how knowledge is acquired and believes that one can best discover knowledge through scientific methodology.. The final factor was composed of the scales of relativism and metaphorism and was termed "Skeptical Subjectivism" due to its emphasis on a symbolic way of integrating knowledge. This view embodies the belief that there

is more than one valid way to interpret data and acquire knowledge.

It is our hope that the three factors will be validated in a current study by the same authors. If the factors remain stable, a new integrative and comprehensive measurement instrument will be possible with minor revisions. A new empirically based questionnaire will allow for better assessment of personal epistemologies and thus aid in determining relationships between epistemological style and other important psychological variables. Better measurement of individual differences in students' epistemological orientations will enable greater interventions on the part of teachers and counselors.

Stephenson, B.W. and Hunt, C. (1977). Intellectual and ethical development: A dualistic curriculum intervention for college students. *The Counseling Psychologist, 6(4),* 39-42.

Strike, K.A. and Posner, G.J. (1982, Oct.). *Epistemological assumptions of college students: An initial report.* Paper presented to the 13th Annual Convocation of the Northeastern Educational Research Association, Ellenville, New York.

Unger, R.K., Draper, R.D., & Pendergrass, M.L. (1986). Personal epistemology and personal experience. *Journal of Social Issues, 42(2),* 67-79.

Wilkinson, W.K. (1989). A contrast of Perry and Royce: Implications for the study of college students' epistemological orientations. *The Canadian Journal of Higher Education, 19(2),* 87-96.

Wilkinson, W.K., & Schwartz, N.H. (1991). A factor-analytic study of epistemological orientation and related variables. *The Journal of Psychology, 125,* 91-100.

Figure 1

Tri-Level Cognitive Pyramid.

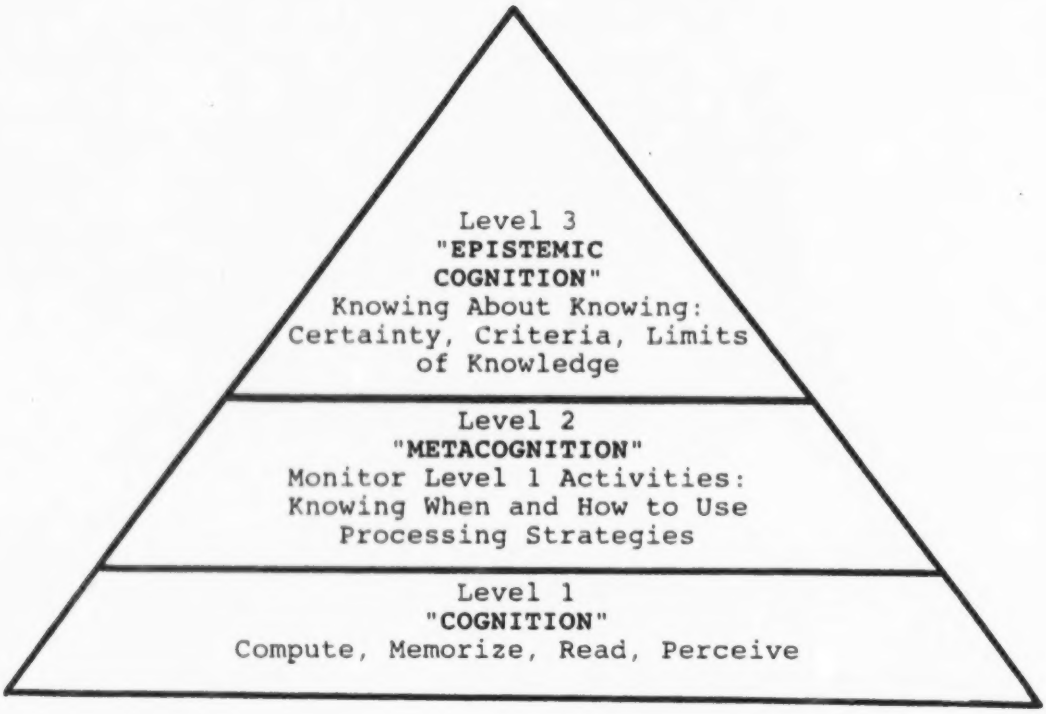

Table 1

Epistemological Assessment Measures Including Scales and Scale Definitions.

| Measure | Scale Name | Scale Definition |
|---|---|---|
| SID (Erwin, 1981) | Dualism | Knowledge exists of facts, and is thus stable and absolute. |
| | Relativism | Knowledge is context dependent, there are no absolutes. |
| PEP (Royce and Mos, 1980) | Rationalism | Knowledge is obtained through logical, conceptual, and analytical thinking. |
| | Empiricism | Knowledge is born from repeated and structured observations and data. |
| | Metaphorism | Knowledge is subjective; true knowledge is personal, involving integration and use of symbols. |
| AAR (Unger, Draper, and Pendergrass, 1986) | Logical Positivism | Knowledge is stable, irreversible, and beyond our control. |
| T/F (Gold & Reimer, 1974) | Thinking | Knowledge results from cognitive and intellectual reasoning. |

Table 2

Factor Loadings of Seven Scales to Three Factors.

| | Factor 1 | Factor 2 | Factor 3 | |
|---|---|---|---|---|
| Relativism | 0.07508 | 0.01508 | 0.88017 | |
| Dualism | 0.78535 | 0.20306 | 0.02431 | |
| Empiricism | -0.01551 | 0.74430 | 0.26681 | |
| Rational | 0.06446 | 0.75650 | 0.02245 | |
| Metaphorical | -0.67436 | 0.28484 | 0.31766 | |
| Logical Pos. | 0.76910 | 0.17688 | 0.27770 | |
| Thinking | 0.17064 | 0.62890 | -0.32151 | |
| Variance Accounted: | 24% | 24% | 16% | Total: 64% |